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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Jin-Shan Wang, et al

INK JET INK COMPOSITION

Serial No. 09/918,584

Filed 31 July 2001

Group Art Unit: 1714

Examiner: Callie E. Shosho

I hereby certify that this correspondence is being deposited today with the United States Postal Service as first class mail in an envelope addressed to Commissioner For Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Robin G. DePoint

Robin G. DePoint

April 16, 2004

Date

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

DECLARATION UNDER RULE 132

I, Huijuan Chen, declare that:

I received the degree of Ph.D from the University of Rochester.

I have been employed as a research scientist with Eastman Kodak Company for over five years;

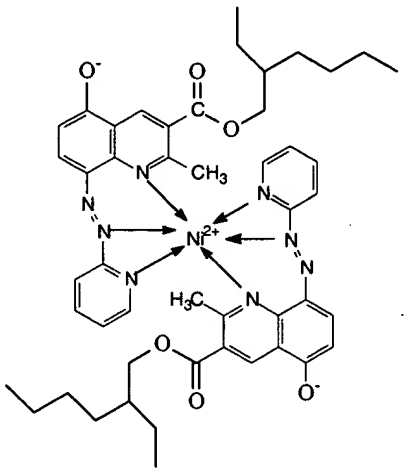
I am a coinventor in the above-captioned patent application; and

I am familiar with the Office Action dated December 17, 2003, and the Advisory Action dated March 29, 2004, and the references cited therein. The following examples are provided as support for Applicants' assertion that the ink jet ink of the claimed invention, which includes a hyperbranched polymer, provides unexpected improvements in jettability over an ink jet ink including a particulate pigment.

The following comparative ink jet ink was prepared with a formulation identical to that of the inventive Examples in the application, except the hyperbranched polymer

was replaced with polymer-dye particles. The experiment was carried out on September 14, 2001, under my supervision, as follows.

Dye-3 was used to prepare the comparative polymer-dye particle dispersion. Dye 3 is a derivative of Dye-1 used to make the hyperbranched polymeric dye HBPD-1 in the application. The structure of Dye 3 is shown below.



Preparation of Polymer-dye Particle Dispersion

To a 400 ml beaker, 1 g of Dye-3 was added, as well as 2.4 g of styrene, 2.4 g of butyl methacrylate, 1.2 g of divinyl benzene, and 2.0 g of ethyl acetate. After the addition, the mixture was well stirred to form an organic phase. In another beaker, 50 g of deionized water, 0.6 g of sodium dodecyl sulfonate surfactant, and 1.8 g of hexadecane were added and well stirred to form an aqueous phase. The organic phase and the aqueous phase were combined and agitated violently by either sonification or a microfluidizer for more than 20 minutes. The organic aqueous mixture was added to a reactor comprising a round bottle flask equipped with a nitrogen inlet and a condenser to keep the reaction under inert atomosphere and avoid evaporation of the reaction mixture. 0.09 g of initiator azobisisobutyronitrile (AIBN) in 1 gram of toluene was then added to the reactor. The reaction was allowed to continue while the reactor was kept at a temperature of 70°C for four hours before being cooled to room temperature. The organic solvent was removed under reduced pressure. The polymer-dye particle dispersion prepared was filtered through glass fibers to remove any coagulum. The particles made contained about 50% by weight of a colorant phase and about 50% by

weight of a polymer phase. The particle size was 87 nanometers as measured by a Microtrac Ultra Fine Particle Analyzer by Leeds and Northrup at a 50% median value.

Comparative Example (Ink containing polymer-dye particles)

To prepare a comparative ink jet ink, 0.55 g of the above polymer-dye particle dispersion (10% active), 0.05 g Surfynol® 465 (Air Products Inc.), 0.6 g glycerol, 0.1 g triethanolamine, and 1.2 g diethylene glycol were added to 7.49 g distilled water. The final ink contained 0.55% dye (in the form of polymer-dye particles), 0.50% Surfynol® 465, 6.0% glycerol and 2.0% diethylene glycol. The solution was filtered through a 3 μm polytetrafluoroethylene filter and filled into an empty Hewlett-Packard HP520 ink jet cartridge. The mean particle size was 82 nanometers as measured by a Microtrac Ultra Fine Particle Analyzer (Leeds and Northrup) at a 50% median value.

Evidence to show no particles formation in the inventive examples

SEC (Size Exclusion Chromatography) was performed on HBPD-1, HBPD-2, HBPD-3, and HBPD-4, which are described in applicants' specification at pages 11 and 12. Polyethylene oxide (PEO) was used as a standard for calibration in water. The absolute weight average molecular weights of HBPD-1, HBPD-2, HBPD-3, and HBPD-4 were 3500, 2500, 3000, and 2700, respectively. These molecular weights correspond to a single macromolecular structure of the respective hyperbranched polymer with less than 30 repeating units, indicating no particulate formation. Inks I-1 to I-4 were made with HBPD-1, HBPD-2, HBPD-3, and HBPD-4, respectively, as described in Applicants' specification at pages13 and 14, and showed no measurable particle sizes when measured by a Microtrac Ultra Fine Particle Analyzer (Leeds and Northrup).

Firability Test

A printing test was done as described in the application at page 14, lines 7-15, with commercially available Epson Premium Glossy Paper, Cat. No SO41286. The above comparative ink was loaded into a Hewlett-Packard HP DeskJet® 520 ink jet printer, and test images consisting of a series of 21 variable density patches,

approximately 15 by 13 mm in size, ranging from 5% dot coverage to 100% dot coverage, were printed onto the Epson Premium Glossy Paper. The elements were allowed to dry for 24 hours at ambient temperature and humidity. The firability was judged based on the quality of the prints using the following ratings:

A: Best - no visual image defects

B: OK - slight image defects (banding, missing lines, etc)

C: Poor - very obvious defects (banding, missing lines, etc)

D: Worst - barely printable, a lot of defects

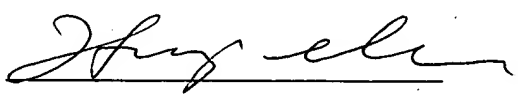
The image generated using the Comparative Example was visually examined against the printed image containing Ink-1 of the invention printed on Epson Premium Glossy Paper. The results are summarized in Table III. Mean Particle Size was determined by a Microtrac Ultra Fine Particle Analyzer by Leeds and Northrup.

Ink	Mean Particle Size (nm)	Firability Rating
C-3	82	D
I-1	Not detectable	A

The above example demonstrates the unexpected improvement in jettability of the claimed invention over inks containing polymer-dye particles.

The undersigned declares further that all statements made herein of the undersigned's own knowledge are true and all statements made on information and belief are believed to be true. These statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 4/16/2004



Huijuan Chen